



Verification of Environmental Monitoring Technologies Technology Profile: On-Line Turbidimeters

Brief Description

“Turbidity” is a term used to describe the “cloudiness” of water caused by suspended particles. It is measured by determining the level of light scattering in a water sample. Light scattering is measured by positioning a detector at an angle (usually 90°) from an incident light beam. The light source can be either a traditional heated tungsten filament or a newer, narrow-wavelength source such as a light-emitting diode or a laser. Optics are used to focus the light source beam and to collect the scattered light. A detector provides a digital reading of the turbidity. On-line turbidimeters can be designed for immersion directly into a water stream or for measurement on a “bypass” sample stream that is drawn from the larger source stream. The detector’s output can be processed to provide continuous monitoring.

How is this important to environmental protection?

Turbidity in drinking water is not necessarily harmful, but it can be a sign that more serious problems are present. Turbidity can interfere with disinfection and provide a medium for microbial growth. Turbidity may indicate the presence of disease-causing organisms. These organisms include bacteria, viruses, and parasites that can cause symptoms such as nausea, cramps, diarrhea, and associated headaches. Food and beverage processors, industries that need high water purity, and water treatment plants that supply drinking water routinely test for turbidity to ensure water quality. Although this can be done by manually collecting and analyzing water samples, that method is both time-consuming and non-continuous. On-line turbidimeters that allow for continuous, real-time monitoring of low-level turbidity increase reliability in assessing whether a plant’s processes are functioning properly. These technologies are not required for use in such plants, but their continuous monitoring capability makes them a popular early warning device, for example, of failing filter integrity.

What federal regulatory program covers turbidity?

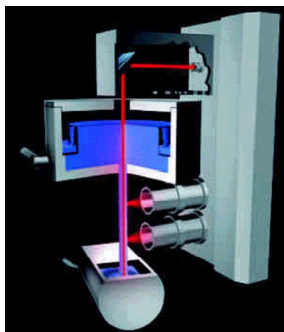
Turbidity monitoring is required on any water produced for public consumption. For example, the Interim Enhanced Surface Water Treatment Rule (IESWTR) established by the U.S. Environmental Protection Agency (EPA) applies to public water systems that use surface water. However, the turbidimeters undergoing verification testing are not approved for monitoring to access compliance with EPA turbidity standards for drinking water. They are, however, applicable to numerous other situations in which continuous monitoring of low turbidity levels is needed.

On-Line Turbidimeters Completing Verification Testing



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Additional turbidimeters can be verified for other vendors.

General Market Information

Who would use this technology? Who would buy it?

Potential customers for on-line turbidimeters include owners and managers of facilities that rely on water purity or water treatment plants that provide drinking water. In such facilities, routine measurement of low turbidity levels is common. These instruments are also used in many other applications in industry and waste treatment facilities to measure higher turbidity levels.

What are these facilities using now?

Some are using on-line turbidimeters to measure turbidity for process control purposes. However, many plants still use "benchtop" turbidimeters, which analyze individual samples drawn from the water stream. The on-line turbidimeters have the advantage of continuous, remote monitoring, while the benchtop turbidimeters require manual sample collection and laboratory analysis and provide only intermittent turbidity data.

Why are companies having these instruments tested?

Manufacturers and vendors of on-line turbidimeters choose to participate in the verification tests to gain additional credibility and more widespread acceptance for their instruments. The verification reports and verification statements signed by EPA and Battelle senior officials can aid in marketing their products.

General Test Information

How are EPA and Battelle Involved?

The EPA's Environmental Technology Verification (ETV) program was established to accelerate the entrance of improved environmental technologies into domestic and international markets through third-party verification testing and reporting of the technologies' performance. The ETV program provides purchasers and permittees with an independent assessment of the technology they are buying or permitting and facilitates multi-state acceptance. Battelle is EPA's partner in managing the Advanced Monitoring Systems (AMS) Center, whose objective is to verify the performance of commercially ready monitoring technologies for air, water and soil. Battelle, a not-for-profit technology research and development organization, designs and conducts the tests with vendor and stakeholder involvement.

What are the factors verified in the test?

The verification test for turbidimeters addresses these performance characteristics:

- ◆ Detection limit - determined from the instrumental response to low-turbidity water under the conditions of testing.
- ◆ Linearity - determined from a multi-point calibration check in the range from 0-5 NTU.
- ◆ Accuracy - compared to bench-top reference turbidimeters.
- ◆ Precision - determined from multiple measurements of a sample solution.
- ◆ Water temperature effects - determined from the change in turbidimeter response to changes in sample temperature.
- ◆ Flow rate sensitivity - assessed from the change in instrumental response over a range of specified flow rates.
- ◆ Color effects - determined from the instrumental response to the addition of color to the sample.
- ◆ Drift - determined from the change in response to one or more standard solutions over an extended period of routine operation.

The generic test protocol, verification test reports, and verification statements for the on-line turbidimeter tests are available on the ETV web site at <http://www.epa.gov/etv>.

When and where were the tests conducted?

The first verification test of on-line turbidimeters was conducted from August through mid-October 1999 at the Dublin Road Water Treatment Plant in Columbus, OH. This municipal plant, constructed in 1975, treats an average of 50 million gallons daily and serves approximately 330,000 people. The plant obtains its water from two reservoirs in the Scioto River Watershed, an area of about 2,000 square miles of predominantly agricultural land.

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